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Reinhardt, J.

Pseudorca Crassidens, a cetacean hitherto unknown in the Danish fauna.

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PSEUDORCA CRASSIDENS,

A CETACEAN

HITHERTO UNKNOWN IN THE

DANISH FAUNA.

BY

J. REINHARDT.

(*Read before the Royal Danish Society of Sciences, the 7th of November,* 1862.)

TRANSLATED FROM THE

'Oversigt over det Kongelige Danske Videnskabernes Selskabs Forhandlinger,' 1862.

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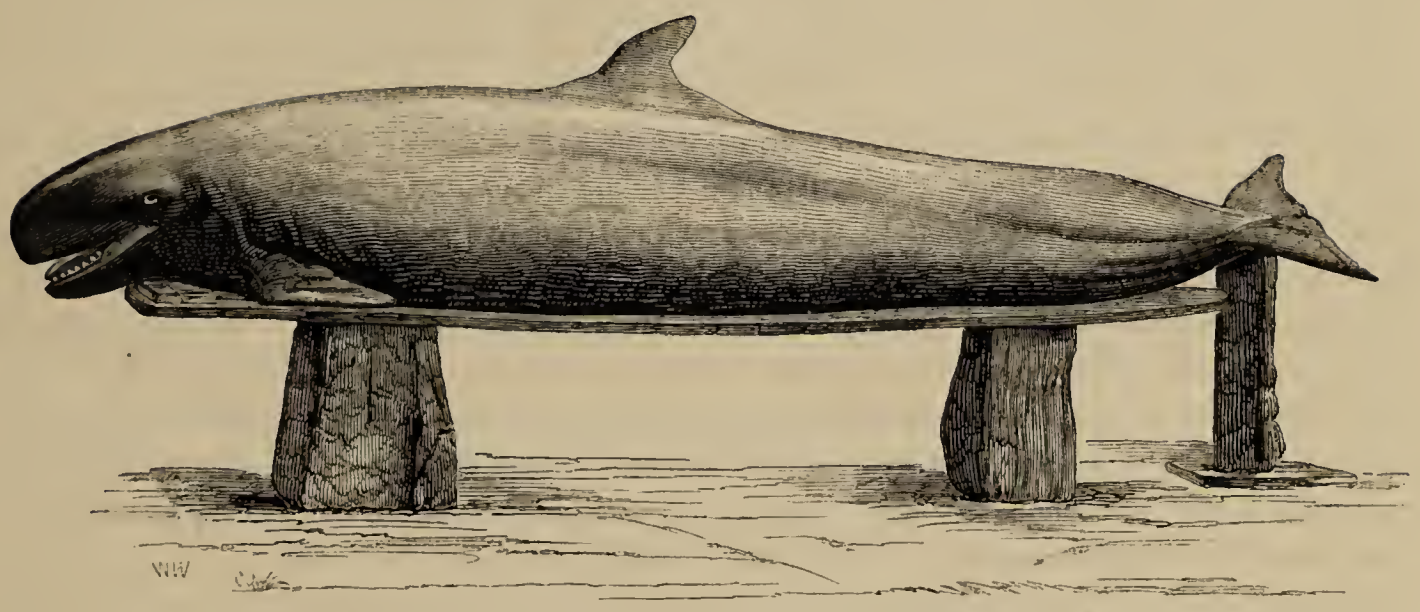
PSEUDORCA CRASSIDENS.



Female, sixteen feet in length ; killed in the Bay of Kiel, November 24th, 1861.[1]

In the course of the summer of 1862, three specimens of a large and, in several respects, remarkable dolphin were thrown dead on the shores of the Danish islands of Sealand and Funen. As chance would have it, my first information was about the one that had last been drifted ashore ; and as the measures taken by me to endeavour to procure some parts of this animal for the Zoological Museum caused me to become acquainted with the individuals which were stranded at an earlier date, I shall begin my account with this specimen.

On the 14th of August, 1862, the local newspaper of Kallundborg, a town on the north-western coast of Sealand, contained the intelligence, which from thence found its way into several of the newspapers of Copenhagen, that a Cetacean said to have been eight or nine ells long had several days before been thrown up dead in the neighbourhood on the southern beach of Asnæs, a small tongue of land belonging to the estates of Count Lerche, of Lerchenborg. The short account contained nothing in reference to the colour or appearance of the animal ; but judging from the statement about its size, I supposed that it was most probably an *Orca* (a so-called "Sværdfisk" or "Spækhugger," or killer), an animal, therefore, tolerably well known ; and as, moreover, there was very little chance of my arriving in time to profit much by a journey to the place where it had been stranded, several days having already elapsed since the occurrence, I thought it not worth while to go. Some three weeks afterwards, however, a tooth was shown to me, which had been found lying beside the dead body, and was brought to Copen-

[1] [This figure (taken from a photograph) is not in the original memoir.—W. H. F.]

hagen by Mr. Rörbye, a medical student, who, while passing his vacation in the neighbourhood of Asnæs, had gone to see the dolphin a short time after it had been thrown up on the beach. The sight of the tooth immediately convinced me that the stranded Cetacean could not belong to any of our species of Orca, but that it must be an animal of which it was important to save even any fragments and detached pieces, and being told at the same time that Count Lerche had caused the carcass to be buried, I applied to him, with a request that the body might be disinterred, so that the bones might be put together to form a skeleton as complete as circumstances would admit of. On arriving at Lerchenborg, I was received most kindly by Count Lerche, who afforded me all the assistance I wanted; but the more accurate accounts I now received at the place itself, I regret to say, in no slight degree diminished the hopes on which my visit was founded. The dolphin had, indeed, been interred, but for the purpose of its being employed as manure, and on account of its considerable weight, and with a view of rendering the work easier, it had first been hewn into many pieces, which then had been spread over rather a large piece of ground, where it would be difficult to find them again. At the same time, however, it was some comfort to me to hear that (as I had rightly concluded) it would not have availed much if I had set out somewhat earlier, for the dolphin had been found on the 9th of August, and had already been cut to pieces on the 11th of the same month, several days before the news of its stranding had reached Copenhagen, and the chopping had been carried out so unsparingly, that the head itself had been divided in the middle, and many of the vertebræ had been split. It soon became evident to me that I must give up the hope of collecting fragments enough for forming a tolerably complete skeleton, but, thanks to the assistance given to me, I succeeded, nevertheless, in finding the most important parts, and among these more especially the fragments of the cranium, the cervical vertebræ, the scapulæ, the bones of the arms and some vertebræ. But as to the verbal information I tried to elicit from those who had seen the animal, as it lay upon the shore, I was not particularly successful; the only thing I could learn with tolerable certainty was, that it was a female nineteen feet long—a little longer, therefore, than it had originally been stated to be. But as to its appearance and colour, the statements were contradictory.

Thus, while the information about this individual remained in an unsatisfactory state, I received during my stay at Lerchenborg another valuable piece of intelligence—that some time before another great dolphin had been drifted dead on the shoal, close to the shore near the lighthouse of Refsnæs, some few miles from Asnæs; that it had been saved, and that the carcass had remained lying on the beach, the blubber having been cut off and melted into about ten gallons of oil. Circumstances did not permit me to go immediately from Asnæs to Refsnæs. I was obliged to return to town first; but having by renewed inquiries ascertained the trustworthiness of the intelligence, and obtained such information as rendered it not improbable that it might be a dolphin of the same species as the one stranded at Asnæs, I accepted the hospitable invitation of Mr. Barner, the owner of a farm in the neighbourhood, and early in October I went there accompanied by the conservator of the museum. I found the animal, of which by far the greater part of the flesh was still adhering to the bones, lying buried in the neighbourhood of the lighthouse at the foot of the sand-hills on the sea-shore, and covered with sand; to my satisfaction it really proved to be of the same species as the dolphin stranded at Asnæs, though indeed a smaller individual, being only about fourteen feet long; and although it had been found as early as the month of June (as I was told), or more than three months before, yet the putrefaction had

not proceeded so far as might have been expected. After two days' rather hard work, the skeleton, defective only in some comparatively unimportant parts,[1] was ready to be sent away, and with a readiness of which I wish to express my sincere acknowledgment, Mr. Barner added to all the other assistance he so liberally had afforded me still another kindness, in ordering the skeleton to be brought to Kallundborg by his own conveyance, thence to be sent by sea to Copenhagen. But as to the appearance and colour of the animal, as it was before the blubber had been cut off, the information obtained here at Refsnæs, was as defective as that formerly received at Asnæs. Not even the sex could be discovered. The people who had found the dolphin could say nothing about it, and in the buried carcass no distinguishable trace of external or internal sexual organs were to be found ; in the flensing, the external sexual parts, as well as the pelvic bones, had been cut off, and the internal parts were so much decomposed that an examination of them gave no result. Lastly, the third carcass was thrown ashore some days before Whitsuntide, near the small town of Middelfart, in Funen. A physician of this town had, immediately after the stranding, informed Professor Eschricht of this event, and at his request sent him the nearly complete skeleton, which my illustrious friend had the great kindness to leave at my disposal, being informed that I had availed myself of the opportunity afforded me by the stranding of the two other individuals, to subject this remarkable Cetacean to a detailed examination. This third individual was almost full-grown, as was sufficiently proved by the skeleton, and the donor stated that it was a male, but we received no further particulars about it. Thus it is only by the skeleton that we have to decide which dolphin it is that in these three cases had been thrown up on our shores, but, fortunately, we need nothing more to settle the question.

That it is none of *the larger species hitherto described* from the North Sea and the northern part of the Atlantic cannot possibly be doubted ; even a slight glance at the figures given in the following pages of the cranium and the pectoral fin will immediately be sufficient to prove that it cannot be any of the Northern species of *Orca ;* no more can it be the *Globiocephalus incrassatus*,[2] a species founded lately on an incomplete cranium, still less the common ca'ing-whale, or pilot-whale, *Globiocephalus melas*, nor finally, the *Delphinus griseus* of Cuvier, hitherto observed in some few cases, the type of the genus *Grampus* of Gray. Another form, however, very peculiar and different from all these more or less well-known large, few-toothed species has lately been observed in our Northern seas ; for on the 24th of November, 1861, a considerable shoal of very large dolphins arrived at dawn in the Bay of Kiel. Some fishermen and sailors in boats succeeded in separating about thirty head from the rest of the shoal, and in driving them up into the harbour itself, where one was killed, but the rest contrived to escape again in spite of all pains taken to drive them on shore. The dolphin killed, a female, sixteen feet long, was exhibited at Kiel, and other places in Holstein, and bought for the anatomical collection of the University of Kiel. No complete description of it has hitherto been published, and of its skeleton, especially, we have no account ; but some information, scanty enough it is true, about the appearance and teeth of the captured dolphin, is to be found in a short account of the whole event, which Dr. Möbius has given in the periodical, 'Der Zoologische

[1] Besides the pelvic bones, only the three last caudal vertebræ and the right pectoral fin were wanting, the last had most probably been carried away by foxes, which had dug a way down to the carcass ; the caudal vertebræ, with the greater part of the caudal fin, seem to have been absent even at the time when the dolphin was found drifting in the sea.

[2] 'Proceedings of the Zool. Soc. of London,' 1861, p. 309.

Garten,"[1] and some additional and more satisfactory knowledge about its outward appearance has also been gained in another way, namely, by the assistance of some photographs, pretty well executed,[2] and a very fine plaster-of-Paris model, about seventeen inches long, which Professor Behn ordered to be made of the animal, just after it was killed. Here accordingly, we have another form that cannot be left unnoticed in deciding the question to what species the animals thrown ashore on Asnæs and Refsnæs belonged; and besides the size, there were, indeed, several other points in the latter specimens, for instance, the form and size of the pectoral fins, the number and appearance of the teeth, that could not but lead our researches to the Kiel dolphin, and raise a strong supposition in favour of its being really of the same species as the object of our present examination. To this it may be objected, that it would be strange if a dolphin, not known to have been observed previously in the North, had now suddenly appeared in the course of a few months, not only once but thrice; it may, however, on second thoughts, be considered still more extraordinary if, at short intervals, *two* great, hitherto unknown Cetaceans had made their appearance on our coasts, and the objection will lose all its weight, when we consider that it was not a single individual, but a great shoal, evidently astray,[3] that entered the Bay of Kiel, and that, most probably, the Refsnæs and the Asnæs dolphins belonged to the same. For it is likely enough[4] that such a shoal, having once strayed into strange and narrow seas, may continue to roam in them for a long time, without being able to find its way out again into the open ocean. However, as we know nothing essential about the Kiel dolphin, except as far as its external appearance is concerned, the skeleton being still perfectly unknown, and as, on the other hand, I did not know much about the outward appearance of my dolphins (the shape of the pectoral fins alone excepted, having found one of those of the individual buried at Refsnæs in a condition so little injured, that I was able to take an exact copy of its outline), I might, indeed, resting on the information before me, consider it to be very probable, that the latter two were of the same species as the former one, but as matters stood, a perfect certainty could only be obtained by a comparison of the skeletons, or at all events of their more characteristic parts. I wrote, accordingly, to Professor Behn, in order to get the question settled in this way, adding a sketch of the cranium of the individual stranded at Asnæs. That gentleman, formerly my fellow voyager, had the kindness not only to confirm my supposition, but at the same time to furnish me with such information about the cranium of the skeleton set

[1] III Jahrgang, No. 2 (Februar, 1862), p. 39. [2] See figure at p. 191.

[3] For we suppose that very few will believe that these colossal animals are natives of the Baltic, and the narrow sounds between our islands, or that they even appear rather frequently in these seas.

[4] That these individuals really belonged to the shoal that entered the Bay of Kiel is rendered still more probable by the fact, already mentioned, that an individual of the same species was also found at Middelfart, shortly before Whitsuntide, 1862, that is just in the interval between the time when the shoal was first discovered in the Bay of Kiel and the stranding of the carcass found at Refsnæs. I should not be surprised if part of the shoal dispersed at Kiel were still, at the time when I am writing this, roaming about in our sounds and belts, and if the two large dolphins which, according to the statements of the newspapers, were thrown ashore at Naskov in the end of October, 1862, should also prove to have belonged to the same species. The size (a length of seven or nine ells, and a "circumference as that of a horse") would at all events favour such a supposition. It is to be regretted that the measures taken to endeavour to preserve some parts of these animals for our museums, have been, as far as I know, unsuccessful.

up at Kiel, that I became convinced that some few trifling particulars in which the crania may, perhaps, differ from each other, are at most only individual differences.

Thus, as it may be considered as an indisputable fact, that in all the different cases mentioned here, we have only to do with one and the same species, the next question will be, whether this species has already been described or not; for though it is not one of the dolphins generally known in the Northern seas, it does not of course follow that it is an entirely unknown form, generally speaking; nor, as we shall see, is this the case. It is true that it may be sought for in vain among the remaining more or less well-known species now in existence; even that one among the latter to which it has, perhaps, the greatest resemblance, the *Delphinus feres*, from the Mediterranean, described by Bonnaterre,[1] but never found again since his time, must, if the description is in any way to be trusted, be quite a different animal, though it agrees with ours, as far as the length of the body and the number and size of the teeth are concerned. But the case is different when we extend our researches to the fossil, or so-called fossil species, for among these there is one, viz., Owen's *Phocæna crassidens*[2] (*Orca crassidens*, Gray),[3] to which at all events it has a most striking resemblance, if, indeed, it is not quite identical with it. This species is founded on a cranium and some other parts of a skeleton, which some twenty years ago were dug up from beneath the layer of turf in the Great Fen in Lincolnshire, not far from the town of Stamford. Thus the circumstances under which these remains are found do not preclude the possibility of their belonging to a species still living, but hitherto unknown, and though their appearance caused the distinguished naturalist, to whom we are indebted for our information about them, to suppose that they were fossil, yet he has himself alluded to such a possibility, improbable as it might have seemed to him. Owen has described nothing but the cranium of his *Phocæna crassidens*, and his description is not detailed enough to admit of any minute comparison between his cranium and ours, being, indeed, especially intended to show the difference between the new species and the killer and the ca'ing-whale; in one particular, finally, the importance of which we shall examine more closely, it may, perhaps, be doubtful whether his description agrees altogether with the state of things as we have found them in our dolphin, but on the other hand, the short description is, on the whole, very appropriate, and the figures by which it is illustrated (viz., two figures of the cranium,[4] and one of the five foremost cervical vertebræ),[5] not only show a resemblance to our dolphin in the general outlines, but they present exactly those characters in particular by which it is distinguished from all the other more or less kindred forms. I therefore, believe, that we must really acknowledge this *Phocæna crassidens* of Owen, to be the dolphin stranded on our coasts, however strange it may seem, that our first knowledge of a Cetacean, of which great shoals are still, in our time, roaming about in our Northern sea, should have come to us through an individual which, thousands of years ago, found its resting place on a sea-

[1] "Tableau Encyclopédique et Méthodique des trois règnes de la Nature," 'Cétologie,' par M. l'Abbé Bonnaterre, Paris, 1789, p. 27.

[2] 'A History of British Fossil Mammals and Birds,' London, 1846, p. 516.

[3] 'The Zoology of the Voyage of H.M.S. Erebus and Terror,' "Mammalia," London, 1846, p. 34. 'Catalogue of the Species of Mammalia in the collection of British Museum;' part i, Cetacea, London, 1850, p. 94.

[4] L. c., fig. 213, p. 516 and fig. 216, p. 523.

[5] L. c., fig. 214, p. 520.

bottom, now forming part of the soil of England. At all events we can hardly help believing in the identity until, either by a direct comparison, or by means of a more accurate description, and more detailed figures of Mr. Owen's fossil specimen, we should be able to point out possible differences, which cannot be derived from the information about this specimen at present before us. But whether our dolphin be the same as Owen's *Phocæna crassidens*, or not, it has a peculiar interest; for though related both with the Orcas, with the *Globiocephali*, and with the genus *Grampus* of Gray, yet it cannot (except by forcing their natural limits), be put down as belonging to any of those genera, either according to its external characters, or according to the peculiarities of its skeleton. The outward appearance of our dolphin is (as we have already said) pretty satisfactorily known from the photographs and the model taken from the Kiel specimen, copies of which are added to this paper, and I shall not stop to give a minute description of it, being unable to add anything to what is already shown by these representations. The hitherto unknown osteology, however, I shall try to detail by means of the more or less complete skeletons of the three individuals which have been at my disposal. Of these individuals, the female stranded at Asnæs is not only (as might be supposed, on account of its more considerable size) an older animal than either of the others, but, judging by the appearance of the bones, even an extremely old individual; the specimen stranded at Refsnæs is, indeed, only very slightly smaller than the male thrown ashore at Middelfart; but the sternum, still consisting of separate pieces, and the cervical vertebræ, less completely ankylosed, make it nevertheless clear that it is the youngest of the three; but even this individual is by no means a very young animal.

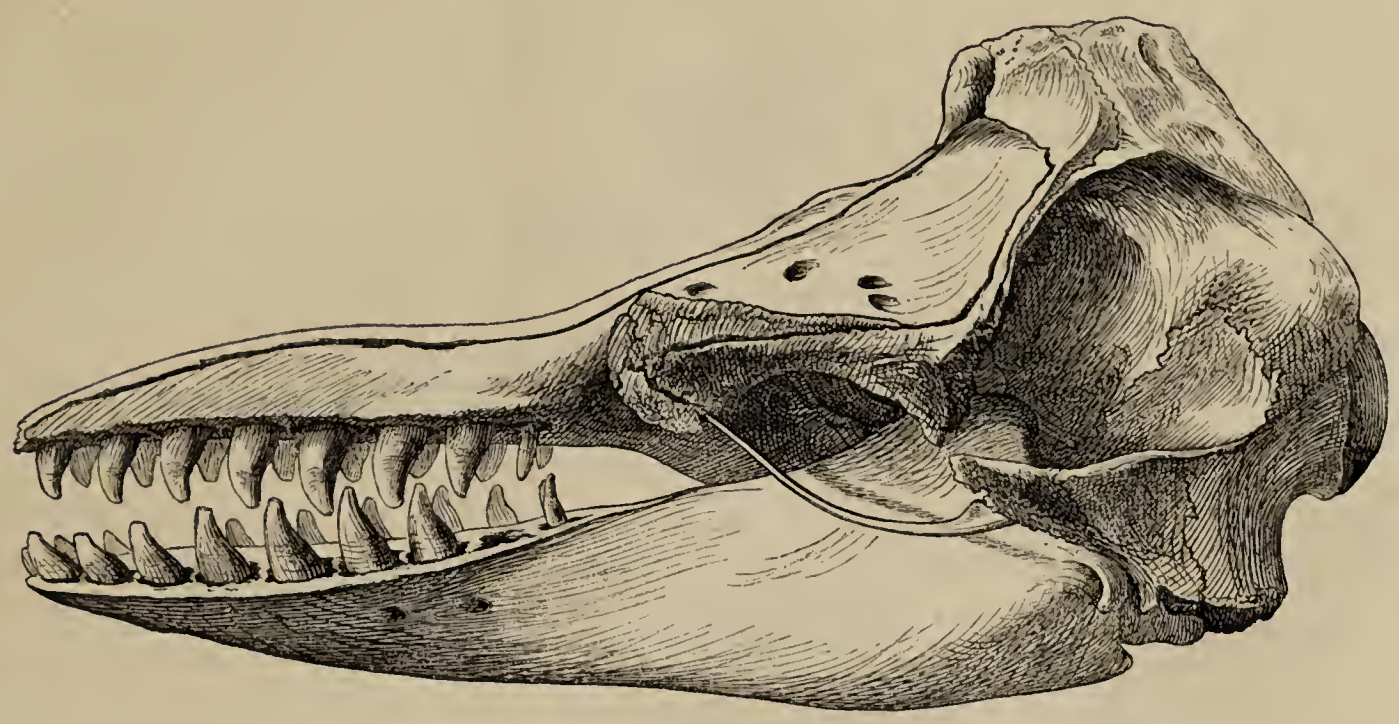
Though all parts of the skeleton of this dolphin may, generally speaking, be called rather powerful in proportion to its size, yet this may more especially be said about the skull, distinguished by its heavy, almost clumsy form, and making nearly one sixth (more exactly two thirteenths) of the full length of the dried skeleton.

Of the dolphins which must be considered as most nearly related to ours, viz., the ca'ing-whales, the grampuses, and the killers, the last-mentioned may, perhaps, be said to resemble it most, as far as the general outline of the skull is concerned; in this respect, we should say that our dolphin differs more from the grampuses, and most, no doubt, from the ca'ing-whales. If we examine the two woodcuts (pages 197 and 198), representing the skull of the individual stranded at Refsnæs at one fourth of its natural size, as seen from the side (fig. 1), and from above (fig. 2), and compare them with the head of an Orca, it will be seen at once that the resemblance between them appears principally in the cranium, properly so called, and is especially produced by the great development of the occipital ridge, and its direction, as well as by the considerable circumference of the temporal fossæ, which again is in relation to the powerful set of teeth, and the corresponding weight and massiveness of the lower jaw. In the details, however, we shall find deviations enough. Thus, the back of the head or the occiput does not slope so obliquely behind, nor is it concave as in the Orcas; but, on the other hand, it is not so abruptly raised, and, at the same time, hardly so much vaulted as in *Grampus* or *Globiocephalus*.

The temporal fossæ are further very deeply excavated in the Orcas, and that part of them which is formed by the frontals is rather larger than smaller than their hindmost part, bounded by the parietal and temporal bones. In our *crassidens*, on the contrary, that part of the tem-

poral fossa which is formed by the frontal bones does not even make one half of the whole fossæ, and that part of its wall that is formed by the parietal and temporal bones is not con-

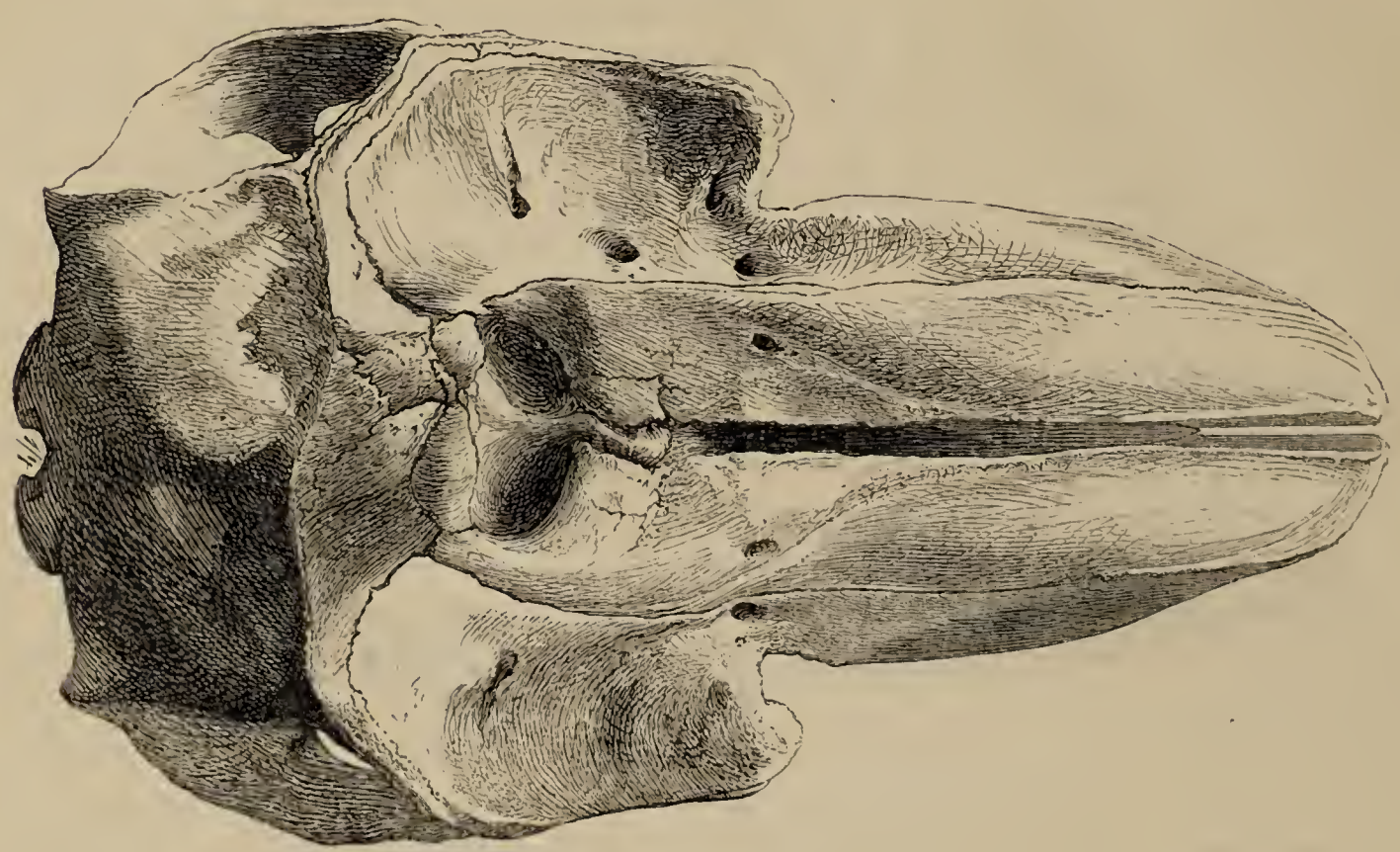
Fig. 1.



cave but convex. Thus, the temporal fossa is, no doubt, less spacious than in the killers, but this diminution in depth is partly compensated for by its being extended farther backwards, than in the latter Cetaceans, as the continuation of the occipital ridge by which it is limited behind, describes a parabolic curve, and not a simple arc of a circle, as in the Orcas (at any rate in the Northern species of this genus). In the grampuses and the ca'ing-whales, the temporal fossæ are much smaller, and the share which the frontal bone has in forming them is of very slight importance, especially in the latter. It is further peculiar to our dolphin, that it is not the nasal bones, but, on the contrary, a projecting knob on the interparietal bone, ankylosed with the occipital bone, behind the occipital ridge, which forms the uppermost point of the skull; for just the contrary is the case in all the three kindred forms. It must further be added that the nasal bones do not approach the occipital ridge so nearly as in the latter forms, but are placed some distance (about three inches) before it; the reason of this is, of course, that that extremity of the interparietal bone jutting out before this ridge, and that strip of the frontal bones which is not covered with the superior maxillaries is broader here than in the other three species. It may, perhaps, seem unsafe to derive a character from such a peculiarity, as in the Cetaceans, the bones of the cranium are frequently modified even considerably in their relative position during the growth of the animal; and, in truth, we cannot do so even in the allied species of the ca'ing-whales, for, when these are young, their nasal bones are almost as far removed from the occipital ridge, as in the form here described, whereas, we know that they come very near to it when the animal has increased in age. But in our *crassidens* we need scarcely fear that age might produce a similar alteration. For the individuals in question, are not only old animals, one of them even unquestionably very old; but a comparison between the latter and the somewhat younger specimen from Middelfart, shows that the distance between the occipital ridge and the nasal bones become even rather greater than smaller, as the animal grows older.

In the facial part ("the beak"), the resemblance to the killers is, perhaps, somewhat less striking; for this part is shorter than the remaining part the skull, contrary to what is the case in

Fig. 2.



those crania of killers which I have examined; it is moreover very broad, and obtusely rounded in front, and is also distinguished by tapering very slightly and very uniformly in a forward direction, so that it is not much narrower even in the middle than in the place where it is broadest farther behind, and these characters seem to become continually more distinct as the animal advances in age; at least we have found that the cranium of the Asnæs dolphin, evidently an extremely old individual, was the one of the three having the shortest and broadest beak. One thing, however, produces a most conspicuous difference between our dolphin and the Orcas, we mean the different breadth of the intermaxillaries; for when we add the fissure between them filled with the cartilage of the primordial vomer, then these bones occupy about two thirds of the whole breadth of the beak in our *crassidens*, while in the Orcas they are much narrower than the superior maxillaries. In this respect we find unquestionably a likeness with the ca'ing-whales, in which the intermaxillaries, as is well known, are also, and even in a still higher degree, remarkable for their breadth; but beyond this no further resemblance is to be found with these in the structure of the beak. In the ca'ing-whales, far more than in our dolphins, the unusual size of the intermaxillaries is produced at the expense of the superior maxillaries, and it is not strange that the latter have a diminished share in the breadth of the beak, as the feeble set of teeth of these animals only requires small and shallow sockets. Behind the short row of teeth, the alveolar margin is further gradually twisted in such a way as to have an edge turned outwards, and this exterior margin of the superior maxillaries is not placed on a level with the intermaxillaries behind, but a little above them, by which means the surface of the beak becomes somewhat concave in this place. It is true that the intermaxillaries of Cuvier's *Delphinus*

griseus are not so broad as those of the ca'ing-whales, (nay not even so broad as those of our *crassidens*); but judging by the figures,[1] this dolphin seems, nevertheless, as far as the rest of the beak is concerned, to be much more similar to these Cetaceans, than to the type of any other species. But the case is somewhat different in the species which we are here describing, the surface of the beak is from its origin somewhat convex, the dental row occupies almost the whole length of the beak, the superior maxillaries have still a considerable thickness, in order to leave room for the very deep sockets of the teeth, and are, generally speaking, much more like the same bones of an Orca than those of the ca'ing-whale or the Grampus.

The asymmetry pervading the whole cranium also affects the intermaxillaries, and especially the hindmost part of these bones. The right one is perceptibly broader than the left, and is quite contiguous with the corresponding nasal bone, its posterior extremity inserting itself between the latter and the superior maxillary; the left, on the contrary, does not extend quite so far backwards, and more especially does not quite reach the nasal bone, which is also influenced by the general asymmetry, being considerably smaller than the right one. Just before the nostrils there is a notch in the inner edge of both of the intermaxillaries, and in the space thus left a portion of the superior maxillaries become visible. In conformity with the general obliquity of the head the visible part of the right superior maxillary is always somewhat larger than that of the left; but the portion of these bones, laid bare in this manner, may, in different individuals, be sometimes a little larger, sometimes a little smaller. Something very similar also takes place in the common ca'ing-whale, and (though in a smaller degree) in the northern killers, and various other dolphins, amongst others in the common porpoise. On the contrary, it does not seem to be the case with *Grampus griseus*, to judge by Cuvier's figures, and from this Cetacean the dolphin here described also differs in another and more important respect, as far as this part of the skull is concerned. The intermaxillaries of *Grampus griseus* are dilated in front of the nostrils, according to the statements of both Cuvier[2] and J. E. Gray,[3] so as to cause a convexity in this place; but no trace of anything of the kind is to be found in our species, in which the intermaxillaries are, on the contrary, somewhat depressed at some distance before the nostrils, and the distinctly defined three-cornered region in this place, denominated by Gray the "triangle," here forms a slight depression, as in most other dolphins.

As far as may be inferred from Owen's short description and small figures of his *Phocæna crassidens*, it must be quite similar to our dolphin, as to all the details of the characters of the cranium which have been examined above; it has, therefore, hitherto been unnecessary to refer particularly to the fossil form, and compare it with our specimens. We shall now mention the only point, as to which the resemblance may at first glance seem doubtful, and which accordingly must be considered more minutely. We know that in the dolphins the vomer is sometimes visible on the inferior surface of the beak (sometimes even in two different places), and thus it may have some share in forming the palatine surface; sometimes on the contrary, it does not appear there at all. Now Owen states that the vomer appears on the

[1] 'Recherches s. l. Oss. Foss.,' 4me ed. Atlas, tome deuxième, pl. 223, figs. 1 and 2.

[2] Ibid., 4me ed. tome 8, 2me partie, p. 125.

[3] 'The Zoology of the Voyage of H.M.S. Erebus and Terror,' "Mammalia," p. 30. Catalogue of the Mamm. in the Coll. of the Brit. Mus., P. 1, Cetacea, p. 82.

osseous palate of *Phocæna crassidens* in the same place, and to the same extent as in the common porpoise.[1] If this statement is to be interpreted according to the strictest sense of the words, it would, perhaps, point out a difference between the fossil form and the dolphins from our shores, for the vomer does not exactly resemble that of the common porpoise in any of the crania. In the common porpoise the visible piece of the vomer is considerably broader, in proportion to its length, than in our specimens; and, besides, it is placed on a level with the bones between which it appears, whereas in our dolphin it is seen lying deeper than the latter, as it were, at the bottom of a fissure between them, when we look down from above upon the palatine surface. But we suppose that Owen's words are not to be explained quite literally. It must be remembered, that he does not compare his fossil form with the common porpoise; but with the great Northern dolphins, the killer, the ca'ing whale, the beluga, and the *Grampus griseus*, in all of which the vomer does not appear at all on the palatine surface. It was, therefore, of little importance to him to lay much stress on any slight possible difference between his fossil form and the common porpoise, relative to their vomers; but only, by a comparison taken from an animal generally known, to state briefly and generally, that the vomer is visible on the palatine surface in the fossil form, in opposition to what is the case in the other great Northern species, and this opinion of ours is corroborated by his own figure, which does not seem to represent the vomer as it appears in the common porpoise. When we take all this into consideration, we shall hardly find sufficient reason to derive, from what Owen states about the vomer of his *Phocæna crassidens*, a difference between it and the dolphin thrown ashore on our coasts, the less so, as individual peculiarities are to be found, at least in the latter, as to the appearance, of this bone, which must render it very unsafe to found any characters upon it. For it is only in the dolphins stranded at Middelfart and Refsnæs, that the vomer appears in the manner described above; not the slightest portion of this bone appears on the palate of the very old individual thrown ashore on the southern side of Asnæs.

The large powerful teeth with which our dolphin, as well as the killers, is provided have caused that the lower jaw, not less than in the latter, is distinguished by a massive thickness and weight, forming a striking contrast to its slender structure in the ca'ing-whales. The difference between our dolphin and the ca'ing-whale is so great in this respect, that the lower jaw of the individual stranded at Refsnæs weighs almost twice as much as the lower jaw, one inch longer, of a Faröe ca'ing-whale; the former being about four pounds, the latter only two pounds and one eighth. It is, however, not only by its great weight and thickness that the lower jaw reminds us of the lower jaw of an Orca, also in its shape it more resembles the latter, than the lower jaw of a ca'ing-whale. If we look at it from the side, we shall find that the inferior edges of its rami are almost straight, as in the Orcas; whereas the same edge of the lower jaw of the ca'ing-whale is very much curved, so as to describe an arc with the convexity turned upwards, the uppermost point of which is found nearly below the posterior extremity of the dental row, so that the jaw, when placed on a level surface, only rests on two points, that is to say, quite at the posterior extremity, and in front at the point where the symphysis commences. This same curvature is also found in the lower jaw of *Grampus griseus*, and further in that of the beluga (*Delphinapterus leucas*), and partly also in that of the narwhal (*Monodon monoceros*); thus, it seems to be characteristic of the

[1] 'Hist. of British Fossil Mamm. and Birds,' p. 518.

great broad-nosed dolphins having only a feeble, or defective set of teeth, whereas the form of the lower jaw of our *crassidens* and the killers is called forth and neecssitated by powerful and large teeth. It is further a consequence of the size of the teeth, that the dental row, just as in the killers, occupies the larger half of the whole length of the jaw, although the teeth are hardly so numerous as in the ca'ing-whale, in which the dental row (even before a single tooth has as yet fallen out) does not occupy more than a third of the jaw; and finally, and partly for the same reason, the difference between the greatest height of the jaw behind and its smallest height elose to the symphysis, is not so eonsiderable as in the ca'ing-whale, and the symphysis itself is comparatively longer than in the latter speeies; but in these two respects also our dolphin bears a close resemblance to the killer. The eonsiderable size of the teeth (eomparatively spcaking, scarcely smaller than those of the killers) has already been briefly alluded to, we must now give a more minute deseription of them. They are slightly eurved in an inward direetion, and placed in deep soekets, whieh both in the upper and in the lower jaw are eompletely separated from each other through their whole extent, whereas the soekets of the teeth of the killers are most frequently only imperfeetly separated. Only between the two hindmost sockets the partition may sometimes disappear, and the eavities may thus become more or less completely eoaleseed. In the lower jaw, the foremost socket approaches the point of the jaw as mueh as possible; but sueh is not the ease in the upper jaw, as the intermaxillaries project in front of it, though only very slightly. The roots of the teeth seem to elose much faster than in the majority of the killers; at least the roots are still perfectly open in the teeth of several erania of a species of large killer from the seas round the Faröe Islands, whieh belonged to animals middle-aged, at least, rather than to young ones; whereas the teeth even of the Refsnæs individual of the species here described have their roots perfeetly pointed, and it is only in the largest teeth that an insignifieant aperture is left in the points of the roots leading into rather a narrow internal eavity. In the upper jaw, the teeth increase in size progressively backwards up to the last tooth, whieh beeomes suddenly again considerably smaller than the preeeding one; in the lower jaw, the foremost tooth is also very small, seareely half as large as the second one; then the teeth uniformly increase in size up to the seventh or eighth, whieh are of about the same size; the ninth is again a little smaller, and the hindmost again less than half the size of this one. The teeth are almost of the same size in both jaws; the largest are two and a half inches in eireumferenee just above the alveoli, and have a length of about three ineh es, of which the enamelled crown oecupies about one third. The number of the teeth is subject to individual differences; Möbius[1] states that the number of the teeth of the individual eaught in the harbour of Kiel, is twenty in either jaw, ten on either side, and Professor Behn has eonfirmed this statement in a letter to the author of this memoir. But this number we do not find repeated in any of the individuals stranded on the Danish eoasts, nor do the latter quite agree with one another as to the number of their teeth. Thus, the individual stranded at Middelfart has nine teeth on either side of either jaw, the total number being smaller by four than in the Kiel dolphin, and there is not the slightest traee of its having had more teeth at an earlier period of its life. In the Asnæs specimen, the teeth had fallen out, and only one or two were found lying on the beaeh, where the body was landed; but by the quite uninjured sockets we may ascertain with perfect eertainty, that this individual.

[1] l. c. page 3.

like the Kiel dolphin, had ten teeth on either side of the lower jaw, of which, however, the two hindmost ones were placed in a common socket, this, however, bearing traces not to be mistaken of having originally consisted of two, now united into one. In the upper jaw, on the contrary, there are only eight teeth on either side, or two fewer than the Middelfart specimen; in the Refsnæs dolphin, finally, of which all the teeth, except one or two, were present, and still fixed in their sockets, when it was disinterred from where it was buried, the number of the teeth, both in the upper and in the lower jaw, was quite the same as in the Asnæs dolphin, but the hindmost tooth in the upper jaw was lodged here in its own socket, perfectly well separated from the last but one. In the Refsnæs dolphin the teeth were but little worn,[1] and, more especially, the teeth of the left side were a little less worn than those of the right side; the teeth of the Asnæs dolphin must, to judge from those very few of which I obtained possession, have been worn a good deal more, especially the foremost ones in the jaw; yet the wear is not greater, than will show perfectly clearly, that this dolphin *keeps its teeth until the last period of its life*. We have hitherto only mentioned those teeth which are fixed into distinct sockets; but besides these, one or even two teeth are sometimes, at least, to be found quite anteriorly on either side of the upper jaw; for these no sockets are to be found, and they can therefore only be fixed in the gums. I have not seen these teeth myself (which have been observed neither in the Middelfart dolphin, nor in the Refsnæs specimen), but I am indebted for my knowledge of them to the kind information of Professor Behn, who told me in a letter that during the preparation of the cranium of the Kiel dolphin, two small teeth were found lodged in the gum; he did not see them himself, until after they had been taken out, but the preparer stated that he had found them in the upper jaw, and as to this point, at least, he can hardly have been mistaken; but whether they were placed one on either side, or both on the same side, Professor Behn found it impossible to ascertain. From the appearance of the teeth, however, he thinks himself enabled to conclude, that two such diminutive teeth must, originally, at least, have been found on either side; for though there is no great difference in their length, yet the one is so much thicker than the other, that it weighs three times as much as the latter (the greater one twelve, the smaller one four grains); thus, it does not seem very probable that they formed a pair, and if this supposition is correct, the original number of teeth in the upper jaw of the Kiel dolphin must have been twelve in either side; it may, however, be doubtful whether these teeth are always to be found, and I feel especially inclined to believe that they were not present in the Refsnæs dolphin.

In order to render my description of the cranium more complete, I shall here add several measurements of the three skulls at my disposal; to make the comparison with *Delphinus griseus* easier, I have chosen chiefly to give the same dimensions that Cuvier has given of the cranium of this animal in his 'Recherches sur les Ossemens Fossiles,' and finally, I have in a fourth column added those measurements which Owen has given of his *Phocæna crassidens*, reduced into Danish inches and lines.[2]

[1] All the crowns of the teeth of the Middelfart dolphin having been broken off, one or two excepted, before the skeleton arrived at this town, it cannot be ascertained, whether its teeth have been much worn or not; though judging from the few uninjured teeth, we should say that the wear has not been much greater in this specimen than it was in the one from Refsnæs.

[2] As to these measurements it must, however, be observed that they do not quite agree with those given by J. E. Gray, though it is the same cranium that has been measured by both the English

	The specimen from Asnæs (♀).	The specimen from Refsnæs.	The specimen from Middelfart (♂).	Owen's fossil *Phocæna crassidens*.
Length of the head measured from the occipital condyles to the tip of beak	—	24″	24″	25″ 2‴
Length of the head measured to the middle of the inferior margin of the occipital foramen	—	23″ 2‴	23″ 2‴	—
Length of the cranial portion measured from the occipital condyles to the posterior wall of the nasal canal	—	8″ 9‴	8″ 6‴	—
Length of the beak measured from its origin on a level with the anterior extremities of the zygomatic bones	10″ 8‴	11″	11″	11″ 7‴
Greatest breadth of the head (across the zygomatic processes of the temporal bones)	14″ 8‴	14″ 10‴	14″ 1‴	—
Breadth of the head across the postorbital processes of the frontals	—	14″ 3‴	14″ 4‴	14″ 6‴
Breadth across the occipital ridge at its union with the temporal ridges	8″ 8‴	9″	8″ 3‴	—
Breadth across the prominences formed by the frontals, the superior maxillaries and the zygomatic bones in front of the orbit	—	13″	12″ 8‴	—
Breadth of the beak at its origin	8″ 3‴	8″ 3‴	8″ 1‴	—
Breadth of the beak towards the middle, just before the most posterior tooth but two	8″ 1‴	7″ 9‴	7″ 6‴	—
Height of the occipital foramen	—	2″ 3‴	2″ 8‴	—
Breadth „ „	—	2″ 2‴	2″ 6‴	—
Distance from the inferior margin of the occipital foramen to the posterior margin of the pterygoid bones	—	8″ 2‴	8″	—
Length of the dental row in the upper jaw	9″ 8‴	10″ 2‴	9″ 9‴	—
Length of the lower jaw measured from the condyle to its foremost extremity	18″ 6‴	19″ 6‴	18″ 4‴	19″ $2\frac{1}{2}$‴
Length of the symphysis	3″	4″	3″ 1‴	—
Length of the dental row in the lower jaw	9″ 1‴	10″ 2‴	9″ 5‴	9″ 2‴

When compared with the greater majority of the other Cetaceans belonging to the dolphin family, the dolphins to which the one treated of here is most closely allied are all provided with rather a small number of vertebræ. The *Grampus griseus*, one of the forms in question having the greatest number, is stated by Cuvier[1] to have only sixty-one. In three skeletons of ca'ing-whales from the Faröe Islands, I find the number of the vertebræ to

naturalists; the discrepancies may perhaps be partly explained by the mutilated state of the skull, which may have rendered it difficult to give some measurements otherwise than approximatively; but, at all events, they show that we must not overrate the small differences found in some dimensions of Owen's cranium, when compared with those of the Danish crania. I may add in this place, that the reason why I have given fewer measurements of the cranium of the Asnæs dolphin than of the two other crania from Refsnæs and Middelfart, is the mutilated condition of the former.

[1] 'Rech. s. l. Oss. Foss.,' 4me ed., t. 8, 2me partie, p. 147.

vary between fifty-eight[1] and sixty, and with this number agree the greater part and the best authenticated of the earlier enumerations of the vertebræ of this species; in some of our Northern Orcas, finally, we find fifty-two, in others fifty-four or fifty-five vertebræ. In this respect, also, our dolphin agrees with its kindred species; nay, its vertebræ are even a little less numerous than those of the Orcas themselves; for in the individual found at Middelfart, we count fifty-one vertebræ, the Refsnæs specimen had altogether fifty. So small a number of vertebræ as this is otherwise only found, within the group of the dolphins, in the beluga, and in the platanista,[2] which deviates in so many respects from the common type. There is some reason to suppose that of the numbers just mentioned, the latter (fifty) will most likely be the normal one, whereas the former seems only to be owing to a supernumerary vertebra, which in the Middelfart dolphin has accidentally increased the number of the dorsal vertebræ beyond the usual number. For in the skeleton of the individual found at Refsnæs, the caudal vertebræ are not, indeed, all present; but if we compare this skeleton with the one from Middelfart, having all its caudal vertebræ, we may easily be satisfied that no more than the last three of them are wanting in the former skeleton, and that the caudal vertebræ have originally been present in both individuals in the same number, viz., twenty-three:[3] in front of the caudal vertebræ, on the other hand, we find altogether twenty-eight vertebræ in the Middelfart dolphin, but only twenty-seven in the one from Refsnæs. A more minute examination will show that the number of the lumbar vertebræ is the same in both individuals, but that the Refsnæs dolphin has ten pairs of ribs, and accordingly as many dorsal vertebra, whereas in the Middelfart dolphin an eleventh dorsal vertebra is to be found behind the tenth, and to this additional vertebra an eleventh rib belongs, lying loose in the flesh on the right side, to which we find no corresponding rib in the left side, a defect which, according to Professor Eschricht's express assurance, is original. The question will therefore be, whether we are rather to suppose that one dorsal vertebra is wanting in the Refsnæs dolphin, or that a supernumerary one exists in the Middelfart specimen; but as, generally speaking, it is certainly more frequently the case that supernumerary vertebræ are to be found in this part of the spine than that any should be wanting, and as the circumstance of the eleventh dorsal vertebra in the case treated of being only provided with one rib, seems further to speak in favour of the first supposition, and as, finally, I have been informed that no more than ten pairs of ribs are to be found in the skeleton of the

[1] In the skeleton, where this number of vertebræ is counted, the last caudal vertebra is evidently ankylosed with the penultimate into one bone, which has been reckoned here as two vertebræ; if it is only counted as one, the whole number will, of course, be only fifty-seven.

[2] The *Hyperoodontes* or *Ziphioideæ* have, indeed, still fewer vertebræ; but they do not, according to my opinion, belong to the dolphins at all, but, in analogy, with the cachalots (*Physeteres*) constitute a group by themselves, equally distinct from the latter, and from the dolphins properly so called, all within the great section or sub-order of the toothed-whales; and when we leave these unnoticed, our statement, as expressed above, is correct.

[3] I consider the hindmost of the two vertebræ to which the first chevron bone (hæmapophysis) is affixed, to be the first caudal vertebra, as is also done in the essay by Eschricht and myself on the Greenland whale, published by this Society. In his earlier essays upon the Cetaceans, and especially in the one on the Ganges dolphin, Professor Eschricht has included the foremost of the two said vertebræ among the caudal vertebræ, whereas, according to the mode of computation followed here, it must be called the hindmost lumbar vertebra.

Kiel specimen, ten dorsal vertebræ may certainly be considered to be the normal number in this species, which, accordingly in this manner, will be provided with seven cervical, ten dorsal, ten lumbar, and lastly, twenty-three caudal vertebræ. In consequence of this comparatively small number of the vertebræ, the single vertebræ, especially in the hindmost part of the dorsal region, in the lumbar region, and the greater part of the tail, are more extended in length than in the ca'ing-whales and the killers, and as moreover the spinous processes are somewhat lower than is the case, not only with the former, but also with the latter, the appearance of the spine, generally speaking, will be found to differ not a little from that of the spine of an Orca, and still more from that of the spine of a ca'ing-whale. It may further be inferred that our species is in this respect no less different from the *Delphinus griseus* also, both from the considerable difference between these two animals in the number of their vertebræ, and from Cuvier's words about this species, first described by him: "Les apophyses épineuses s'élèvent beaucoup sur le commencement des lombes," seeming also to denote that such is the case; but his description is so short, that we are not able from it alone to obtain an accurate idea of the peculiarities of the spine of this *Delphinus griseus*.[1]

If we pass to the examination of the details of the vertebral column, and in the first place to that of the cervical vertebræ, we shall find that the ankylosis of these is farther advanced than either in the killers, or in the ca'ing-whales. For though in old animals of the former species, the four or five, or in rare instances, perhaps, even the six foremost cervical vertebræ may be ankylosed by means of their spinous processes,[2] yet it is only the two, or, at most, the three foremost of the vertebral bodies that are ankylosed; the rest of them always remain separate, and though the bodies of the six foremost cervical vertebræ may sometimes be ankylosed in the ca'ing-whales, yet both the sixth and the fifth may also, even in very large, and evidently very old individuals remain separate from each other, and from the preceding ones. But in the species of which we are now treating it is not only the six foremost, but in some individuals, even all seven cervical vertebræ that have their vertebral bodies ankylosed. Thus, the former is the case in the individual drifted ashore at Asnæs, the latter in the male stranded at Middelfart; it is true, that only the five foremost cervical veretebræ have their bodies ankylosed[3] in the individual found at Refsnæs; but this must most probably only be considered as a consequence of the greater youth of this individual; for the thin posterior epiphysis of the fifth cervical vertebra is not united with the middle piece of the vertebral body, and both the epiphyses of the sixth are still free; and it is certainly probable that, just as the anterior osseous disk of the fifth vertebral body is already perfectly united, not only with the middle piece of the body, but further with the body

[1] 'Rech. s. l., Oss. Foss.,' 4me ed., tom. 8, 2, page 147.

[2] Of the cervical vertebræ of an Orca from the Skagerak preserved in the Royal Museum, the four foremost are perfectly ankylosed by means of their spines; the spine of the fifth cervical vertebra is, indeed, perfectly separated from these ankylosed spines of the preceding vertebræ, but, on the other hand, it is again ankylosed to the spine of the sixth cervical vertebra, and it is placed so closely up to the fourth one, and the irregularities in the contiguous surfaces fit so exactly together, that the thought strikes us quite naturally that these, too, are going to be ankylosed, and that if the animal had grown somewhat older, all the six foremost cervical vertebræ would have been united by their spinous processes, while only the three foremost are ankylosed also by their bodies.

[3] The same was the case with the individual on which Owen founded his *Phocæna crassidens*, but we are not informed whether this was a young animal or not.

of the preceding fourth cervical vertebra, so the posterior epiphysis of the fifth vertebra would not only in time have become united with the middle piece, if the animal had grown older, but an ankylosis of the contiguous epiphyses of the fifth and sixth vertebral bodies would also have taken place during the process of ossification. But it may be doubted, whether the ankylosis of the body of the seventh cervical vertebra with the other six, is to be considered as a consequence of the increasing age of the animal, or whether an individual difference, independent of age, does not prevail in this particular; at all events, there is not any other reason to consider the individual thrown ashore at Middelfart to be older than the one from Asnæs; it must on the contrary, be supposed to be younger; for, in the Middelfart specimen, the epiphyses of the vertebral bodies are much farther from being united with the middle pieces in the remaining part of the spine, and especially in the dorsal region, than in the Asnæs dolphin, where the growth of the vertebræ is all but completed. In the five foremost cervical vertebræ, the arches are ankylosed partly by means of their *processus obliqui*, partly by the points of the spines, though not exactly in the same manner in all individuals; but the arches of the two posterior cervical vertebræ are not united with those of the preceding ones in any of the three individuals which I have been able to examine, and the ankylosis of the cervical vertebræ seems to be fully as much advanced in the bodies themselves, as in the arches, contrary to what is otherwise usually the case. There are also some peculiar characters in the transverse processes; in the atlas we find as usual a thick transverse process; but the axis, which in the killers and in the ca'ing-whales (at least in *G. melas*) is also furnished with a powerfully developed transverse process, not much inferior in size to that of the first cervical vertebra, presents in our dolphin only a slight trace of such a process in a projecting ridge; this, however, as well as the well-developed process itself of the allied forms of dolphins, must be supposed to correspond to both the superior and inferior transverse processes of the succeeding cervical vertebræ. Such double transverse processes are also found in our species, though only in quite a rudimentary condition in the third, fourth, fifth, and sixth cervical vertebræ; the superior ones appear like thin, vertically placed, osseous laminæ, subject to individual differences, that on the third cervical vertebra being the largest; the inferior ones are more knob- or knot-like, but about these, too, it holds true that they are hardly found quite similar in size and form in any two individuals, and one or another of them may even sometimes be entirely wanting. As to these last-mentioned processes, our dolphin may be said to have a middle place between the killers, in which they have also the form of irregular osseous knobs, but are, however, considerably larger than those of our dolphin, and the ca'ing-whale, in which they may almost be said to have totally disappeared. But in the structure of the seventh cervical vertebra a striking resemblance appears again between the ca'ing-whale and our species; for this vertebra, which has no inferior transverse process, is (like that of the ca'ing-whale) provided with a superior transverse process turned obliquely forwards, several times longer and thicker than the preceding ones, whereas, in the killers, the same process is as rudimentary as those immediately preceding it. Thus, generally speaking, and contrary to what appears to be the case in many other parts of the skeleton, the cervical vertebræ resemble those of the ca'ing whale much more than those of the killers, and the most essential and conspicuous difference between our dolphin and the ca'ing-whale in this portion of the vertebral column is, properly speaking, limited to the one already alluded to, which appears in the very different development of the transverse processes of the second cervical vertebra. It must be left undecided how far our dolphin and

the *Grampus griseus* resemble each other or not in their cervical vertebræ, so long as we, with respect to the latter, have only Cuvier's description to go by, which as to this point is quite insufficient. To judge by his words, we may, perhaps, surmise that his dolphin agrees with ours, at all events, insomuch that all seven cervical vertebræ grow together into one solid osseous mass; for his words are: "dans le *griseus*, les cervicales se soudent aussi promptement que dans le dauphin;"[1] but, at the same time, it must not be overlooked that he expresses himself in much the same manner about his *Delphinus globiceps*, generally considered as identical with the *Delphinus melas* of Traill, although, in this instance, the seventh cervical vertebra (at any rate according to my experience) remains separate throughout life.[2]

The body of the first dorsal vertebra is scarcely longer than that of the seventh cervical vertebra, but that of the second dorsal has already almost double the length, and the succeeding vertebræ uniformly increase in length. The distinction between two different elements in the anterior of the processes known by the name of *processus obliqui*, or *articulares*, in the dorsal and lumbar vertebræ, namely, partly the real articular process, partly the wartlike process—*processus mammillaris* as it is called, placed outside the former, a distinction which of late has been pointed out, especially by A. Retzius, must to a certain degree be acknowledged as justifiable in our dolphin, as in the Cetaceans generally; mammillary processes may, properly speaking, be distinguished already in the second dorsal, and even in the seventh we may still, though with difficulty, discern both one of these and an articular process placed inside it. But from thence these two sorts of processes are united in one, and as the mammillary processes are not particularly prominent, even where they are largest, but may very well be regarded as parts of the articular process, I prefer to take no further notice here of the distinction made by Retzius, and accordingly to use the denomination of *processus obliqui*, or *articulares*, in their earlier, and more common

'Rech. s. l. Oss. Foss.,' l. c., p. 147. As to the comparison used by Cuvier in this place, I may, perhaps, be permitted to observe, that while he assumes all seven cervical vertebræ to be ankylosed in the *Delphinus delphis* (l. c., p. 140), it is stated by Rapp ('die Cetaceen,' p. 62) that only the two foremost are ankylosed in this species. Dr. Jackson finally, who in 'Boston Journal of Nat. Hist.,' 1845, has described a dolphin from the coast of North America, which, according to his supposition and that of Gray, may, perhaps, be referred to *Delphinus delphis*, is (according to Gray's citation of the original essay, inaccessible to me) said to have "the first and second cervical scarcely moveable upon each other; and the other five smaller and rather more moveable" (Gray, 'Catal. of Cetacea,' p. 122). I must leave it undecided how far the discrepancies of these statements are caused by different species or individuals of different age having formed the objects of the different researches, or by what other manner they are to be explained. I shall only remark that, whether Jackson's seven feet long dolphin was the genuine *D. delphis* or not, his statement about a mobility, be it ever so slight, between the axis and the atlas, may, perhaps, be considered doubtful. Even in such forms as have only these two vertebræ ankylosed, but the rest of the cervical vertebræ free as *D. tursio*, the bodies of the two first-mentioned vertebræ are so completely ankylosed, that we cannot even point out any limits between them, and by examining fœtuses of *Phocæna communis*, it will be seen that the coalescence is already to be found in these. We shall hardly in any dolphins find a mobility between the atlas and the axis, except in those few cases in which all the cervical vertebræ remain free throughout life; and such is only the case with forms that are generically widely different from the group to which *Delphinus delphis* belongs, namely, with the narwhal, the beluga, and the platanista.

[2] l. c., p. 146. "Dans le globiceps les cervicales se soudent assez vite."

sense. If we continue, then, to use this terminology, we shall find that the posterior articular processes have already disappeared in the sixth dorsal of the Refsnæs dolphin, and in the seventh dorsal of the Middelfart individual, whereas the anterior ones do not entirely disappear until quite posteriorly in the caudal vertebræ. But whereas these anterior articular processes in the different genera of dolphins still continue to clasp round the root of the preceding spinous process, in a shorter or longer portion of the dorsal and lumbar region, even after the articular surfaces have disappeared, and though they have advanced upwards themselves on the vertebral arch to the roots of the spinous processes, there is not one amongst them in our dolphin that reaches quite to the spinous process preceding it. This, we suppose, is partly owing to their not being particularly large themselves, but also to the considerable length of the vertebral bodies by which the intervals between the spinous processes are rendered uncommonly large. I know no other dolphin besides this where such is the case; in the nearly related species of the killers we still find some eight or nine vertebræ, the spines of which are thus clasped from behind by the articular processes of the succeeding vertebra, and even in the ca'ing-whales, though, perhaps, in this respect more similar to the one here treated of than any other dolphin, we always find some of the spinous processes of the posterior dorsal vertebræ enclasped in this manner.

Ten pairs of ribs, which I have previously thought right to consider as the normal number in our *crassidens*, is a smaller number than is found in any other dolphin; even the kindred species of the killers and the ca'ing-whales have eleven or twelve pairs, and according to Cuvier, the last number is also found in *Delphinus griseus*. Of these ten pairs, the five foremost are true ribs; the six foremost attach themselves to the vertebral bodies, as well as to the transverse processes; the four posterior pair, on the contrary, are only affixed to the latter, and thus have neither neck or head. In the skeleton of the male stranded at Middelfart, however, we find, as it were, a trace indicating that the seventh pair of ribs was also intended to have fastened itself both to the vertebral body and the transverse process. For though in this pair of ribs there is not the slightest trace of any neck in the ribs themselves, yet the anterior margin of the transverse process of the seventh dorsal sends out a cylindrical process, pointing obliquely forwards and inwards towards the hindmost part of the body of the sixth dorsal, where again we find a projecting knob analogous to the similar one of the preceding vertebra to which the head of the sixth rib is attached. It is, however, only in the right side of the skeleton, that this interesting peculiarity is seen exactly as I have described it; for this little process that strives to form a bridge in an oblique direction from the transverse process of the seventh dorsal to the body of the sixth, is in the left side somewhat more slender than in the right side, nor has it on this side preserved its connection with the transverse process, but is, on the contrary, ankylosed with the body of the last-mentioned vertebra. In both cases, however, it cannot be doubted for an instant, but that it really is some trace, or rudiment of a costal neck, intended for the seventh pair of ribs, that we have before us, though having become entirely separated from the rib, and ankylosed with the vertebra, with which it was to have been attached. We sometimes find the same peculiarity in the seventh dorsal of the ca'ing whale, nor should we wonder if this similarity were considered as indicating some very close relationship between our dolphin and the latter species. Now, I shall not deny that some similarity may really be found to exist between them in this respect, as far as I have hitherto only found this peculiarity in these two species; but the importance we may ascribe to this similarity, is, at any rate, very

insignificant. The circumstance, that the process does not appear in exactly the same manner on both sides in the Middelfart dolphin, would in itself warrant any misgivings as to its being an important or constant feature, nor, indeed, do we find even a trace of it in the skeleton of the individual found at Refsnæs; and the ca'ing-whale is exactly in the same case, for this peculiarity is found in some individuals of this species, but is entirely wanting in others; and thus, we suppose, it can hardly be entitled to be considered other than a mere accidental, though, perhaps, frequent abnormality.

The sternum consists of four pieces; in the full-grown male from Middelfart the three foremost of these are united into one bone, in which, however, we may still discern the limits between the original parts tolerably well; the hindmost portion, on the contrary, though completely ossified, is only moveably joined with the preceding ones. The four pieces of the sternum of the individual found at Refsnæs are not yet ankylosed to one another, and the hindmost piece is still only cartilaginous; the sternum of the female drifted ashore at Asnæs had been broken when the animal was cut up, and I only succeeded in finding one of the fragments. I cannot, therefore, state with certainty, whether in the last period of life all four sternal bones become completely ankylosed, but it can hardly be doubted but that such is the case. In the foremost piece, or manubrium, the surface turned upwards is longitudinally concave, but transversely convex; the surface turned downwards is, on the contrary, longitudinally convex, and, especially in its foremost extremity, transversely concave, in its posterior portion it becomes gradually more flat in this direction. Behind the place where the first rib is attached to it, the margin of the sternum projects into a pointed angle which, however, does not assume the character of a special process, to such a degree as in the ca'ing-whale, and still more in the killers. Not far from its anterior edge, the manubrium is perforated in the mesial line by an oblong hole of somewhat different size in the different individuals, and, in the old individual from Asnæs we find, a couple of inches behind this, another much smaller hole, of which, however, nothing is to be seen in the two other individuals; both holes are of course indications of the original ossification of each of the sternal bones from two centres situated side by side. Of the most nearly allied forms, the ca'ing-whales are also provided with the foremost of these holes, but in *D. griseus* it is wanting, according to the statement of Cuvier, nor do I find any traces of it in the Orcas, but as may readily be supposed, this hole is not a character of particular importance; it may be found in forms which differ very much in other parts of their skeletons, and it may be wanting in one or the other of two nearly related forms. I find it in a *Lagenorhynchus*, and in the common porpoise; it is further to be found in *Delphinus delphis;* on the contrary, it is wanting in *D. tursio*, in the platanista, the narwhal, and the beluga. In the Refsnæs dolphin the individual pieces of the sternum are considerably narrower, and, especially the second one, comparatively longer, than is the case with the male found at Middelfart, and thus the sternum seems to change its form pretty much with age. I shall only add still that an asymmetry similar to that which appears in the skull, pervades the whole sternum; for this bone, but particularly its anterior portion, has like the skull, a slight but perceptible twisting from the right to the left. I do not, however, mention this asymmetry as something peculiar to this dolphin; the same appears more or less distinctly in other species also, and is, perhaps, even the rule, but this asymmetry in the dolphins, which may also appear in the ribs being a little longer on the right than on the left side, has commonly been completely overlooked, though, indeed, it is well deserving of attention.[1]

[1] As far as the cachalots are concerned, Mr. William S. Wall has pointed out an obliquity also

If we return again to the vertebral column, we still find the size of the vertebræ uniformly increasing as we pass backwards in the lumbar region; we saw in the dorsal, the vertebral bodies becoming continually wider, and at the same time increasing in length, at least, as far as the two or three hindmost ones, and even these are by no means shorter than those nearest preceding them; therefore the lumbar region is considerably longer than the dorsal region, the proportion between them being about that of three to two, though the lumbar are not more numerous than the dorsal vertebræ. It is almost superfluous to remark that the vertebral arches become gradually smaller, and the spinal canal more narrow as the vertebral bodies increase in size. Besides the character which the vertebral bodies possess in the lumbar region in their long and massive form, they are in this species, as in many others, distinguished by still another, of which, however, we have found slight traces also in the posterior dorsal vertebræ; for a longitudinal keel is found along the under side, which is already distinguishable, though not very prominent, in the first lumbar vertebra, but very conspicuous in the third, and which then is continued in the same manner in all the following lumbar vertebræ, down to the very last, but again disappearing in the caudal vertebræ. It has already been mentioned that the species treated of here is distinguished by the inferior height of all the spines; though these are not so low as in the narwhal, not to speak of the beluga, yet there is at any rate a striking difference between the relative height of the spines of our species and those of the killers, and especially those of the ca'ing-whales, and this difference in addition to the considerable length of the vertebral bodies gives, especially to the lumbar vertebræ, a somewhat different appearance from that of the allied forms[1] just mentioned; a comparison of the measure-

in other parts of the skeleton besides the skull. For in his *Catodon Australis* he has discovered an asymmetry, not indeed in the sternum (where, however, it is also most probably to be found), but in the pectoral fins and the ribs, the right pectoral and the right ribs being larger than the pectoral and the ribs of the left side; and of his genus *Euphysetes* (*Kogia*, Gray), he states that the middle piece of the sternum (the foremost one had been lost), is asymmetrical. All the left ribs, one only excepted, being wanting in the only skeleton existing of this singular form, he has not been able to inform us whether the asymmetry here, as in his *Catodon*, also extended to the ribs; nor does he state whether the pectorals are of different sizes, probably in consequence of their being both more or less defective. (See 'Description of a new Sperm Whale, together with some Account of a new Genus of Sperm Whales, called Euphysetes,' Sydney, 1851, pp. 5, 25, and 52.) But as regards the dolphins, no one seems to have mentioned anything of the kind. The only statement that might contain any evidence of an earlier observation of such a deformity is, as far as I know, to be found in a passage of Eschricht's essay on the Ganges-dolphin (*Platanista*), in the 'Transactions of the Royal Danish Academy of Sciences' (Fifth series, 2nd volume). For here the "sternal body" properly so-called, of the skeleton described (a young female), is said to consist of two osseous lateral pieces, of which the left one "is only half as large as the right;" but Mr. Eschricht does not add anything to inform us, whether he considers this difference in size as normal or accidental, or whether, generally speaking, he considers it to be of any importance; and he has overlooked or, at least, not mentioned, the fact, that the manubrium, too, is somewhat, though not very much, deformed. [The description of the skeleton of *Catodon Australis* quoted above, though published under the name of Wall, was really written by the late Mr. W. S. M'Leay. See Dr. G. Bennett's 'Gatherings of a Naturalist in Australia,' 1860, p. 162.—W. H. F.]

[1] How great, or how small the similarity existing between the vertebræ of our species and those

ments of one of the lumbar vertebræ in each of the species mentioned, will, perhaps, give an adequate idea as to this point, better than a long description, and I have chosen for this purpose to give the dimensions of the fifth lumbar vertebra, as one of those provided with the highest spines:

	In the specimen from Refsnæs.	In the specimen from Middelfart.	In a large *Orca glaciator*.	In a very large ca'ing-whale from the Faröe Islands.
Total height	8″ 3‴	9″	15″ 10‴	13″ 6‴
„ breadth	11″ 3‴	12″	17″ 6‴	14″ 8‴
Height of the vertebral spine . . .	4″ 2‴	5″ 1‴	6″ 9‴	7″ 2‴
Transverse process	4″	4″ 7‴	5″ 6‴	5″ 4‴
Length of the vertebral body . . .	3″ 8‴	4″	5″	4″ 1‴
Breadth of the same	3″ 2‴	3″	5″ 9‴	4″ 2‴

In the anterior lumbar vertebræ the spines lean continually more and more backwards; but from the fifth the spines, as well as the arch itself, begin gradually to be placed in a somewhat more vertical position, without, however, proceeding so far that either the arch, or any of the spines (not even farther backwards in the caudal vertebræ) are inclined in a forward direction, and thus becoming, in this respect, directly opposed to the preceding ones, as is otherwise generally the case, more especially in forms nearly related with ours. The peculiarity may possibly, as far as the spines are concerned, be partly a consequence of their decreasing very considerably in length; but whatever its cause may be, it is very characteristic of our dolphin, when compared with the allied forms, and it is only in the more distantly related beluga that the anticline in the vertebral column has also as it were disappeared. The transverse process of the first lumbar is inclined in a forward direction, contrary to the transverse processes of the dorsal vertebræ, which point in rather a backward direction; the angle, however, which this process thus forms with the vertebral body has only a very slight deviation from a right one; this deviation, becomes still smaller in the nearest succeeding vertebræ, and the greater part of the transverse processes of the lumbar vertebræ must be said to be placed at right angles with their respective vertebræ. They preserve the same breadth throughout without becoming broader towards their free extremities (as in certain other dolphins, for instance the narwhal), the first of them may, indeed, be said to be the longest; but there is only very little difference in this respect between this one and those nearest succeeding it.

The foremost of the caudal vertebræ have bodies still thicker and as long as the hindmost lumbar vertebræ, but from the fifth they become progressively shorter, and at the same time more compressed, until finally the height of the bodies becomes greater than their breadth; this shape is then retained up to the place where the hæmapophyses disappear (between the fifteenth and sixteenth caudal vertebræ); here, as usual in the dolphins, the appearance of the vertebræ is

of the *Delphinus griseus* may be, can only be decided by an examination of the skeleton itself of the last mentioned, preserved in the Paris Museum; in his remarks upon the osteology of this species, Cuvier mentions the vertebral column only very briefly, and does not give us any detailed description of the vertebræ. A new and more accurate description of the skeleton of this remarkable form would therefore remove an essential defect in Cetology.

changed quite suddenly, their breadth now becomes much greater than their height, and at the same time they are very short, and it is these peculiarly formed caudal vertebræ that are inclosed in, and support the caudal fin. The vertebral spines, already very low in the last lumbar vertebræ, become still lower in the caudal vertebræ; we should say that a spine, properly so-called, can scarcely be pointed out further back than in the twelfth; but the vertebral arch itself still remains as a narrow osseous bridge, and does not quite disappear until in the fourteenth caudal vertebra. The so called *processus articulares*, (*P. mamillares*, Retz.), as two separate processes, are not retained farther backwards than the fifth caudal vertebra, then they dwindle down into a single knob, placed in the mesial line at the root of the vertebral spine. The transverse processes, properly so called, may already be said to have all but disappeared in the eighth caudal vertebra, but an indistinct rudiment of such a process may, however, still be traced in the two succeeding vertebræ. As something quite peculiar to the species here treated of, it ought to be particularly mentioned that the transverse processes of the caudal vertebræ are, from the very first, perforated by a hole near the root, through which the lateral branches of the great artery of the tail ascend, whereas in the nearest related dolphins (the genera *Orca* and *Globiocephalus*), this hole does not appear until in the third, fourth, or even fifth caudal vertebræ, as in these forms, the arteries in question do not perforate the transverse processes of the foremost caudal vertebræ, but ascend behind them. The dolphin which, as regards this peculiarity, comes nearest to the species here treated of, may, perhaps, be the narwhal, the osteology of which in other respects is very different from that of our dolphin; for in that animal we find the hole already in the transverse process of the second caudal vertebra; in all other dolphins with which I am acquainted, it does not appear until farther backwards in the caudal region than even in the Orcas and ca'ing-whales, sometimes not until the thirteenth or fifteenth caudal vertebra (as in a species of *Lagenorhynchus*). The chevron bones (hæmapophyses) are sixteen in number; the two foremost are quite open beneath, or, in other words: their lateral parts are not united together; they are, moreover, much smaller than the succeeding one, and somewhat asymmetrical; in the Middelfart dolphin, the third one also, indeed, still consists of two separate lateral parts, but it seems that these would in time have been united into an arch, and this union has already taken place in the Refsnæs dolphin, though this individual is not a little younger than the former. On the other hand, it is not very probable that the lateral parts of the two foremost hæmapophyses ever grow together.

As the pelvic bones were wanting in both the otherwise complete skeletons at my disposal I can state nothing about them, and thus it only remains to give some account of the pectoral fins. The woodcut in the following page, which, at one fifth of the natural size, represents the structure of the left pectoral fin with the scapula, of the Refsnæs dolphin, will give a sufficient idea of the form of the different bones, so that a more detailed description will scarcely be necessary, and it may, therefore, be enough to add some few observations. The scapula is, comparatively speaking, as high as in the killers, and considerably higher than in the ca'ing-whale; but what especially distinguishes it from that of the latter, is that the three ridges destined for the insertion of the muscles, which run down from the superior arched margin towards the articular cavity, on the outer surface of the scapula, and which in the ca'ing-whale are so extraordinarily high and prominent, are here very feeble; the two foremost of them even scarcely distinguishable. Finally, it deserves to be mentioned, that the acromion and the *spina scapulæ* issuing from it, have been removed to the very foremost edge of the scapula, so that the so-called *fossa supraspinata*,

can hardly be said to be placed on the side of the scapula, as it forms, on the contrary, a narrow surface slightly excavated, and turned in a forward direction.[1] The pointed pectoral fin itself,

Fig. 3.

in its outline, more resembles the same member of the ca'ing-whales, and partly that of *Grampus griseus*, than that of the Orcas; but still it essentially differs from the pectoral fins of the former by its inconsiderable length, and its much smaller size, generally speaking. In the carpus there are five bones, two of which are placed beneath the ulnar bone, two under the radius, and the fifth again under the latter two between the radius and the first phalanges of the second and third finger. Some of these bones may sometimes be ankylosed in old individuals; such at least, is the case in the Asnæs dolphin, with the two placed beneath the ulnar bone. In the male from Middelfart, the fingers were mutilated and incomplete, in both pectoral fins; in the Refsnæs dolphin there are two phalanges in the thumb, seven in the second finger, six in the third, three in the fourth, and two in the fifth finger, including the five metacarpal bones.

Very different is the structure of the manus of the *Globiocephali*. In the skeleton of a very large and old ca'ing-whale from the Faröe Islands, I find four phalanges in the thumb (though only in the right one, the left has but three), fourteen in the second, ten in the third, three in the fourth, and two in the fifth finger. Thus, the two fingers on which the length of the manus depends have almost twice as many phalanges in the ca'ing-whale as in the dolphin

[1] Cuvier says very little about the scapula of his *Delphinus griseus*; a comparison between this and the scapula of the species here described, must, therefore, be founded essentially on his very small figure ('Recherches sur les Oss. Foss.,' 4th ed., pl. 224, fig. 15); but it is doubtful whether such a comparison can be made with profit, especially as we are not quite sure, whether some mistake has not occurred relative to this figure. It is, at least, a suspicious circumstance, that this scapula, which is that of an animal that can not have been more than three and a half metres long, is in the figure considerably larger than the scapula of the much greater ca'ing-whale (fig. 16 of the same plate), though both are said to be represented at one eighth of their natural size. I have, therefore, not thought it right to found any comparison on this figure.

here described. It is not, however, only on the number of the phalanges that the extraordinary difference in the length of the fins of these two forms depends; the shape of the individual phalanges also contributes its share to this effect, being comparatively much longer in the ca'ing-whale than in our species, in which, indeed, their length still surpasses their breadth in the first three fingers, but the difference between the two dimensions is, nevertheless, only small. The dolphin here treated of stands in this respect about midway between the *Globiocephali* and the Orcas, in the latter of which the breadth exceeds the length of the phalanges, even in the two longest fingers; but as to the number of the phalanges, it approaches the latter more than the former; for in an old male Orca, from the Kattegat, I count two, seven, four, three, and two phalanges; but in spite of the resemblance, in this respect, the shape of the pectoral fin is (as we have said) extremely different also from that of the Orca. Cuvier states[1] the number of the phalanges of *Delphinus griseus* to be two, eight, seven, two, and one; if no errors have slipped into this statement, we are almost forced to believe that the phalanges of this dolphin are comparatively longer even than those of the *Globiocephali*, and accordingly as to their shape still more different from those of our dolphin than those of the last-named genus; for as we shall see presently, this *Delphinus griseus*, remarkable in several respects, but the description of which, we are sorry to say, is only rather superficial, must have comparatively longer, though, at the same time, broader pectoral fins than the ca'ing-whale; and it is not probable, that their great length is in any essential degree owing to an unusual length of the bones of the fore-arm.

	The specimen from Asnæs (♀)	The specimen from Refsnæs.	The specimen from Middelfart (♂).
Total length of the skeleton	—	13′ 1″[2]	13′ 5″
Length of the seven cervical vertebræ	—	4″ ½‴	3″ 1½‴
„ „ six foremost cervical vertebræ	3″ 3‴	3″ 4‴	2″ 8½‴
Length of all the lumbar vertebræ reckoned to the first hæmapophysis	—	3′ 3″ 6‴	3′ 5″
Length of all the caudal vertebræ	—	5′ 3″[2]	5′ 3″ 6‴
Breadth of the first cervical vertebra	9″ 6‴	9″ 1‴	9″ 2‴
„ first dorsal vertebra	—	6″ 7‴	6″ 4‴
„ last dorsal vertebra	—	11″ 4‴	1′ 0″ 6‴
„ broadest (the first) lumbar vertebra	—	1′ 0″ 3‴	1′ 0″ 10‴
Height of the scapula measured from the middle of the articular cavity to the middle of the superior arched margin (*basis scapulæ*)	8″ 6‴	7″ 6‴	7″ 6‴
Breadth of the scapula measured by a straight line between the angles which the base forms with the anterior and posterior margins	1′ 0″ 5‴	10″ 6‴	10″ 10‴
Length of the humerus	5″	4″ 5‴	4″ 6‴
„ the radius	5″ 6‴	4″ 8‴	4″ 7‴
„ the ulna	4″ 2‴	3″ 7‴	3″ 6‴
Breadth of both bones of the fore-arm at their inferior extremity	5″ 11‴	5″	5″ 2‴
Length of the manus measured in the recent (undried) condition	—	1′	—

[1] ' Recher. sur les Oss. Foss.,' 4me ed., t. viii, 2, p. 147.

[2] In this measurement, the three hindmost caudal vertebræ wanting in the skeleton are in-

It will have appeared from the above description, that the osteology of the dolphin here treated of bears in not a few respects a close resemblance to that of the killers, but that mixed with this resemblance we have found some features belonging to the ca'ing-whale and the Grampus, while, finally, besides these, certain peculiarities occur unknown in either of the forms mentioned. It might be supposed that something similar might be also said relative to the outward appearance of this dolphin; one glance, however, at the subjoined figure[1], which represents at a reduced scale the outline of the plaster-of-Paris model mentioned above of the individual captured at Kiel,[2] will show us, that such is only partly the case, and that the resemblance, more especially with the ca'ing-whale, is, perhaps, still smaller in the outward appearance than in the

Fig. 4.

osteology. This may easily be explained by the fact that some of the external characters that contribute most to give the ca'ing-whale its very peculiar appearance, do not at all depend on, nor are necessitated by, the osteology, and it is in these very peculiarities that the form here described differs completely from the ca'ing-whale. Thus its head has not the immense globular swelling in front, nor the short, but distinct, beak, or rather upper lip, jutting out from this, by which the ca'ing-whale is characterised; but its profile, on the contrary, slopes smoothly from the occiput down to the rounded and blunt snout, or in other words, its head resembles that of an Orca, only that the snout is thicker and shorter. The difference is scarcely less, as far as the back-fin is concerned. The very long, but low back-fin of the ca'ing-whale, of which the vertical height does not equal more than one third of the length, has no resemblance to the short, but pointed, and rather high than low fin of the species which is the subject of our examination; and whereas this fin in the ca'ing-whale, in spite of its length,

eluded, their length being assumed to be one and a half inches; for such is their length in the skeleton from Middelfart, and this is so inconsiderably longer than that from Refsnæs, that we run no risk of making a mistake, in supposing these three little bones to be of equal size in both.

[1] This figure which Professor Behn with great readiness has permitted me to have drawn and published is, on the whole, I hope, a faithful copy of the original plaster-of-Paris model; but the back-fin is according to his advice, drawn from one of the two photographs taken of the animal in its fresh condition, the plaster-of-Paris cast not being quite true to nature in this particular; in the outline of the pectoral fin, I have had an insignificant alteration made, according to the paper copy which I had taken of the member in question from the dolphin found at Refsnæs.

[2] See also the figure at the head of the memoir, copied from the photograph of the same specimen.

is placed entirely on the anterior half of the body, so that a line, drawn from its point vertically down to the axis of the body, will meet the latter at some distance in front of the centre of the whole body, it is on the contrary placed somewhat farther backwards in our dolphin, and the line just mentioned will here fall rather behind than before the middle of the body. A very conspicuous difference between these two dolphins, which though necessitated by the osteology, has only been briefly alluded to before, and which must therefore now be more minutely examined, is to be found in the shape of the pectoral fin. The ca'ing-whale, we know, is distinguished by the very long, narrow, and pointed pectoral fin; its breadth being scarcely one fourth of its length, and the latter dimension is so considerable as to equal one fourth of the whole length of the animal. In the dolphin here described, the cut (if I may use this expression) of the pectoral fin, indeed, still resembles that of the ca'ing-whale, but it is broader in proportion to its length (the proportion is about as one to three), and it is, moreover, so short, that it is contained eight or nine times in the total length; our dolphin, therefore, can by no means be said to have long, but on the contrary, short pectoral fins. To these important differences between these two forms, we must still, besides the remaining osteological characters, mention the great difference already pointed out in the size of the teeth and the comparative length of the dental row, on which, however, I shall dwell no longer, as it may be supposed that none of those who, generally speaking, admit of the necessity of subdividing Cuvier's genera *Delphinus* and *Phocæna*, would think of placing our species in the same genus with the ca'ing-whale.

We have seen above, that at present it is difficult or rather impossible to define exactly the degree of the difference in the osteology between the dolphin here treated of, and Cuvier's *Delphinus griseus*, the type of the genus *Grampus*;[1] and it is scarcely easier to do it, as far as the external form is concerned. D'Orbigny's description of this species,[2] published by Fr. Cuvier, the only original one founded on autopsy existing, is not particularly minute in its details, and the figure following the description, (though, indeed, far superior to the older, and extremely indifferent one, of the individual stranded at Brest, which accompanied G. Cuvier's first account of this dolphin,)[3] was, as we know, not drawn until twelve or thirteen days after the stranding of the animal, so long after death, therefore, that the decomposition had most probably altered its appearance not a little, especially as the occurrence took place in the hot summer-time. Accordingly, even the latter and better figure must, on this account, be used with caution, and it

[1] Besides Cuvier's *Delphinus griseus*, the typical species of the genus, three other species have been placed by Gray, in the genus *Grampus*, one of these, however, *Gr. Richardsonii* is only founded on a single lower jaw in the British Museum, which was, moreover, for some time supposed by him to belong to the typical species itself; the *Gr. Sakamata* is only founded on the narratives of the Japanese, about a dolphin inhabiting the sea around Japan, in which others believe they have recognised a true killer; the third, finally, is Risso's *Delphinus aries* (*D. Rissoanus*, Desm.), which considered as a species is most certainly perfectly well-founded, but it can hardly be set down as an undoubted fact, that this Cetacean is to be placed in the same genus with *Delphinus griseus*. Its osteology is still perfectly unknown, and other authors are inclined to consider it to be nearly related to the ca'ing-whale. Thus it is, in my opinion, only *D. griseus* that can be referred to, when we are speaking of the characters of the genus *Grampus*.

[2] Fr. Cuvier's 'l'Histoire naturelle des Cétacés,' p. 184, pl. xii, fig. 2.

[3] 'Annales du Museum,' tom. xix, tab. i, fig. 1.

would scarcely be advisable to found even on this figure a detailed comparison with our dolphin. I shall not therefore lay any particular stress on the circumstance, that the Grampus seems to have a much thicker, and a much more swollen head than our dolphin, and that the back-fin, to judge from the drawing, is placed still further backwards than in the latter, although Gray has not hesitated to set down this position of the back-fin as one of the characters of his new genus. But even though it might be less prudent to found a comparison between our dolphin and *D. griseus* on the other differences which it may be possible to derive from D'Orbigny's figure, yet there is at all events one difference, moreover completely confirmed by the description of the same observer, and fortunately appearing in a part of the body which is attacked by putrefaction only very late, and the form and outline of which cannot be greatly altered by this process, I mean the pectoral fins. For these are not only much longer in the *Delphinus griseus* than in our species; but they must even be comparatively longer than the pectoral fins of the ca'ing-whales themselves;[1] for in the ten feet long individual, examined by D'Orbigny, they had the very considerable length of three feet, and thus their length was only contained three and one third times in the total length, a proportion between the length of the pectoral fin and that of the animal itself, that never occurs in the ca'ing-whale. The pectoral fin is, moreover (both in the drawing, and according to the measurements given), placed uncommonly far backwards in *D. griseus* (three and a half feet behind the point of the snout), so that its point, when the fin is laid along the body, almost reaches as far back as the posterior margin of the dorsal fin. When to this extremely important difference in the length and position of the fin, we add the no less essential one, appearing in the teeth, our dolphin keeping all its teeth until its greatest age, whereas *D. griseus*, provided even that, generally speaking, it retains its teeth in the upper jaw beyond the first period after its birth, or in other words, provided these teeth really ever become fully developed, loses them at all events so early, that not even a single one of them has remained in any of the individuals hitherto examined, though amongst these have been young animals of a length of only little more than seven feet,[2] if finally,

[1] Cuvier's description of the pectoral fins of *Delphinus griseus* is somewhat obscure, perhaps a consequence of the falling out of a word. However, if the meaning really is (as I should almost suppose), to ascribe to this dolphin pectoral fins comparatively shorter than those of the ca'ing-whale (Cuvier's *D. globiceps*), it seems to me that it is only a want of attention that has caused Cuvier to express himself in this manner; for in this case the measurements which he has given (the length of the animal ten feet, that of the pectoral fin three feet), would contradict his description, which is to the following effect: "Leur pectorales pointues sont longues de trois pieds sur un pied de largeur à leur base, moins qu'au globiceps, mais plus qu'à la figure de dauphin ventru de Hunter," ('Rech. s. l. Oss. Foss.,' 2me ed., t. v, 1, p. 284; 4me ed., t. viii, 2, p. 99).

[2] It is very well known, that it is not only in his *Delphinus griseus*, that Cuvier mentions such a falling out of the teeth of the upper jaw. According to him, the same is found to take place in a more advanced age also in other great, blunt-headed dolphins, among others in the ca'ing-whale. Without being willing, or venturing, to deny the correctness of the statement generally, yet, as far as the last-mentioned dolphin is concerned, I cannot but suppose, that such a falling out of the teeth must at any rate be of very rare occurrence. I have seen no trace of it in any of the numerous ca'ing-whales' crania (some of very old animals), which the Royal Museum, during a long course of years, have frequently received from the Faröe Islands, and once from Greenland; nor have I seen any cranium wanting the teeth of the upper jaw, among the many crania preserved in other collections in this town, except as far as they might have been lost during, or after, the preparation, nor have I

we also take the different osteological differences mentioned above into consideration, it seems to me, that we must come to the conclusion, that the species here treated of cannot find its place much more naturally in the genus *Grampus* than among the *Globiocephali*.

The next question is then, whether our dolphin is a killer (*Orca*)? We have seen that it has been considered as such by J. E. Gray, who was, however, only acquainted with it from the cranium discovered in the English fen, and this opinion of Dr. Gray's may at all events be considered as a proof of my not having overrated, in the preceding pages, the resemblance between our dolphin and the killer in this part of the skeleton. But this supposition, though, perhaps, quite justifiable, as long as the skull and the cervical vertebræ were all that we had to go by, cannot now be maintained any longer, the whole animal being known both as to its external appearance and its osteology. Our dolphin, come back, as it were, from the dead, appears to me to present sufficient differences in both these respects, to entitle us to consider it as the type of a special genus, the place of which will be between *Orca* and *Grampus*, and for which I propose the name of *Pseudorca*. The most essential external distinguishing marks between this and the genus *Orca* will be found then in the shape of the body, generally speaking, more slender and extended in length; in the small and pointed pectoral fins, so completely different from the large, very broad, and oval pectoral fins of the killers; and finally in the smaller and differently shaped back-fin; but besides these the snout of the killers, less blunt than that of our species, and the very peculiar colouring characteristic of the former, might we think also afford distinguishing characters of the two genera. The osteological characters of the two genera have been sufficiently illustrated above. This new genus will form a connecting link, hitherto wanted, between the genus *Orca* and the genera *Grampus* and *Globiocephalus*, and thus it will, if necessary, serve to prove how unsafe the opinion is, that the killers, from a systematic point of view, ought most properly to be considered as a division among the toothed-whales of more than generic worth, "as a group or family by themselves,"[1] an opinion lately expressed, but as I think neither sound in itself, nor, indeed, supported by any defensible reason.

One observation about this species must still find a place here. The female thrown ashore at Asnæs was stated to be nineteen feet long, and though its skull is, indeed, no larger than those of the two other, and smaller, individuals, yet the other bones of its skeleton which I succeeded in obtaining for my use, will show that it really must have been an animal not a little larger than the latter. The dolphin captured in the harbour of Kiel, also a female, which Professor Behn was kind enough to inform me was pregnant, but most probably only for the first time, and which, accordingly, we suppose was scarcely an old and full-grown animal, measured little more than sixteen feet. The male thrown ashore at Middelfart, most undoubtedly rather an old animal, was, on the other hand, about fourteen feet long, at the most. Thus the question remains whether in the *Pseudorca*, there may not possibly be a difference in the sizes of the different sexes, and whether the females are not larger, but at the same time, perhaps, provided with a head comparatively smaller, than that of the males. The question can of course only be solved by more numerous opportunities of observation, but I think it worthy of consideration.

been able to learn that such a want of teeth in the ca'ing-whale has ever been observed in the Faröe Islands.

[1] 'Oversigt over det Kongelige Danske Videnskabernes Selskabs Forhandlinger,' Mai, 1862, p. 87.

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